REMARKS

The undersigned notes the concurrently filed RCE Transmittal. In this RCE Transmittal, entry of the amendments in the Amendment After Final Rejection filed April 30, 2008, is requested, and entry of the present amendments is also requested, each providing part of the necessary Submission for the RCE Transmittal. In view of the filing of the RCE Transmittal, entry of amendments in the Amendment After Final Rejection filed April 30, 2008, as well as the present amendments, is clearly proper, notwithstanding Finality of the Office Action mailed October 31, 2007. Furthermore, in view of the present amendments and of the amendments in the Amendment After Final Rejection filed April 30, 2008, the RCE Transmittal is clearly proper.

Applicants are presently amending their claims, as amended in the Amendment After Final Rejection filed April 30, 2008, in order to further clarify the definition of various aspects of the present invention. Specifically, Applicants are amending claim 7, the sole independent claim being considered on the merits in the above-identified application, to delete recitation that the resin substrate or the resin film on a substrate is deformed, and to delete recitation that releasability of the convex portions is different from that of the concave portions, and to recite instead that a mold-releasing agent is provided only on top of surfaces of the convex portions of the mold, and to recite that the mold-releasing agent is a solid and has a coefficient of friction smaller than that of the concave portions. See, e.g., Example 2 on pages 8 and 9 of Applicants' specification, particularly the description at the end of the paragraph bridging pages 8 and 9 of Applicants' specification that the diamond-like carbon (DLC) film is preferable as the mold-releasing agent because it is hard, durable, can withstand the pressing process more than once and has a low

friction. Claims 8 and 14 have been amended in light of amendments to claim 7; and claims 11 and 12 have been cancelled without prejudice or disclaimer.

Moreover, new claims 15 and 16 have been added to the application. Claims 15 and 16, dependent respectively on claims 7 and 15, respectively recites that the mold-releasing agent is an agent provided by a chemical vapor deposition process, and recites that this chemical vapor deposition process is a plasma chemical vapor deposition process. See, e.g., Example 2 on pages 8 and 9 of Applicants' specification.

Applicants respectfully submit that all of the claims being presented for consideration on the merits in the above-identified application patentably distinguish over the teachings of the references applied by the Examiner in rejecting claims in the Office Action mailed October 31, 2007, that is, the teachings of the U.S. patents to Chou, No. 6,309,580, to Hubert, et al., No. 6,957,608, to Osawa, et al., No. 6,855,286, to Seltmann, et al., No. 5,073, 588 and to Willson, et al., No. 6,719,915, under the provisions of 35 USC 103.

It is respectfully submitted that the teachings of the applied references would have neither disclosed nor would have suggested such a nanoprinting mold as in the present claims, for forming a fine structure on a resin substrate or resin film on a substrate using a press machine, with a mold-releasing agent provided only on top surfaces of convex portions of the mold (the mold having a concave-convex pattern), the mold-releasing agent being a solid and having a coefficient of friction smaller than that of the concave portions of the mold. See claim 7.

By providing the mold-releasing agent, only on top surface of the convex portions of the mold, which is a solid and has a coefficient of friction smaller than that of the concave portions, a solid, hard and durable mold-releasing agent can be

provided, so that the mold can more easily and effectively withstand the pressing process in using the mold, and can be used an extended number of times.

Moreover, the mold having such mold-releasing agent has a low coefficient of friction, so that a pillar with a high aspect ratio can be transferred with high accuracy.

Furthermore, it is respectfully submitted that the teachings of the applied references would have neither disclosed nor would have suggested such nanoprinting mold as in the present claims, having features as discussed previously in connection with claim 7, and, moreover, wherein the mold-releasing agent is provided such that in removing the mold from resin which forms the fine structure produced by molding, projections of the resin are elongated as compared to a depth of concave portions of the mold. See claim 14.

In addition, it is respectfully submitted that these references as applied by the Examiner would have neither taught nor would have suggested such a nanoprinting mold as in the present claims, having features as discussed previously in connection with claim 7, and, additionally, wherein the mold-releasing agent provides a mold-releasing layer only on the top surfaces of the convex portions of the mold, whereby the mold includes the mold-releasing layer only on the top surfaces of the convex portions (note claim 8), particularly wherein mold-releasing layer is a diamond-like carbon layer (see claim 13); and/or wherein the mold-releasing layer has a thickness smaller than a pattern depth of the mold (see claim 9); and/or material of the mold as set forth in claim 10; and/or wherein the mold-releasing agent is an agent provided by chemical vapor deposition (see claim 15), in particular, plasma chemical vapor deposition (see claim 16).

It is emphasized that according to the present invention the mold-releasing agent is a solid, and is provided only at top surfaces of the convex portions of the

mold. By providing the mold-releasing agent only at top surfaces of the convex portions of the mold, that is, selectively as in the present claims, columnar structures, formed by molding, illustratively and not to be limiting can have a height three times as large as the depth of the mold, the columnar structure not being an exact transfer of the shape of the mold. As stated on page 8 of Applicants' specification, if the mold-releasing agent is provided at both convex and concave portions of the mold, the resin would come off so smoothly during the release step that the concave-convex pattern of the mold would often be transferred exactly as is. Under such circumstances, desired columnar structure which is a feature of the present invention would not be obtained. Therefore, in the present invention, when the columnar structure of a desired shape is to be obtained with high reproducibility, the mold-releasing agent is applied only to the top surfaces of the convex portions of the mold.

It is again emphasized that as presently claimed, the solid mold-releasing agent, provided as a layer (note claim 8), achieves a mold which is durable and can be used many times, thus making use of the mold more efficient and accurate in light of durability of the mold.

It is emphasized that features of the present invention as in claim 7 include that the mold has a mold-releasing agent provided only on top surfaces of convex portions of the mold. This feature can provide an advantage as seen in Fig. 4c of Applicants' disclosure, and described in the sole full paragraph on page 8 of Applicants' specification. For example, and to be illustrative, using a release jig bonded to the back surface of the mold at room temperature, the mold was lifted vertically at a rate of 0.1 mm/s, whereby the resin filled in the mold cavities was also lifted while being closely attached to the walls of the holes, as shown in Fig. 4c. As a result, a columnar structure as shown in Fig. 4d was formed. Accordingly, a fine

structure having a high aspect ratio can be transferred to a resin substrate or a resin film on a substrate.

Chou discloses a process of using an improved mold or microreplication surface that creates patterns with ultra fine features in a thin film carried on a surface of a substrate. A molecular moiety having release properties towards other materials (e.g., fluorinated hydrocarbon chains or polysiloxanes) and low chemical reactivity to moldable polymers is bonded to a mold or microreplication surface. The release properties of the molecular moiety having release properties allows for the enhancement of resolution on the molded article since the molded material is released from the minute features of the mold on a molecular level. Note, for example, the paragraph bridging columns 2 and 3 of this patent. See also column 3, lines 21-27; and column 4, lines 56-62. Note also the paragraph bridging columns 5 and 6, describing the specific type of reactive compound bonded to the mold surface. See also Figs. 1A-1E, and descriptions in connection therewith in the paragraph bridging columns 7 and 8 of this patent. Note also column 9, lines 36-39 and 61-64.

It is respectfully submitted that Chou discloses a release surface over the entirety of the mold, for enhancing release of the mold from the molded article formed. It is emphasized that Chou has as is intended purpose the thin coating on the entirety of the mold, for ease in removing the mold and for use of the mold a multiplicity of times. It is respectfully submitted that the disclosure of this patent would have taught away from the presently claimed subject matter, including the mold-releasing agent being provided only on top surfaces of the convex portions of the mold, and advantages thereof achieved by the present invention in providing the columnar structure using a press machine.

The Examiner contends in Item 3, on page 2 of the Office Action mailed October 31, 2007, that the nanoprinting of "Chou does not have the material entering into the recessed portion 16a". However, note that in some embodiments, top portions 24a or film 20 "may contact depressed surfaces 16a of mold 10". Note column 8, lines 7-21 of Chou. In any event, note that in Chou the release layer 17 is provided to improve the release of the thin film layer 20 from the features 16 of the mold. Emphasizing that Chou is directed to improve release of the thin film layer 20, it is respectfully submitted that this reference would have taught away from the mold having the selective positioning of the mold-releasing agent as in the present claims, so that releasability of said convex portions is different from that of concave portions, and advantages due thereto as discussed previously; and/or wherein the mold-releasing agent is a solid and has a relative coefficient of friction as in the present claims, and advantages thereof. In this regard, note that the Examiner acknowledges that Chou, "fails to teach application of the release agent specifically on the convex surface of the pattern". To the contrary, it is respectfully submitted that Chou positively discloses forming the release film on the entire surface of the pattern, to release the film 20.

It is respectfully submitted that the teachings of the secondary references as applied by the Examiner would not have rectified the deficiencies of Chou, such that the presently claimed invention as a whole would have been obvious to one of ordinary skill in the art.

Hubert, et al. discloses contact printing for the fabrication of micro-devices, with controlled printing using liquid embossing techniques. Note column 1, lines 48-50. This patent discloses that liquid embossing involves depositing or coating a layer of liquid ink on a suitable substrate or print medium, and that the liquid inks

comprise nanoparticles that are dispersed in a solvent medium. See column 1, lines 63 and 64, and column 2, lines 10-12. This patent addresses the problem of producing multiple prints with high throughput, with a contact print method. See column 1, lines 37-44. According to Hubert, et al., the stamp is modified by treating protruding features, the recessed features or a combination thereof, with a surface modifier (such as a metal, a polymer and/or a fluorochemical), chemical exposure (such as with an oxidant or an etchant), radiation (such heat or light) and/or any combination thereof; and that where the protruding features of the stamp are treated with a surface modifier, a thin layer of surface modifier can be deposited onto regions of contact between the substrate or printed medium and the stamp during the embossing process which alters or modifies the surface properties of the substrate or print medium in the regions of contact and prevents the re-flow of the liquid ink. See column 3, lines 40-52. Note also column 3, lines 34-40 and 53-57. Note also column 5, lines 6-9.

Initially, it is emphasized that Chou is directed to formation of release surfaces, for a mold, while Hubert, et al. is concerned with contact print methods using liquid embossing techniques. Chou addresses the problem of producing smaller pattern size while maintaining cost efficiency, while Hubert, et al. is concerned with producing multiple prints with high throughput. In view of differences in technology between that of Chou and that of Hubert, et al., and different problems addressed by each, it is respectfully submitted that one of ordinary skill in the art concerned with in Chou would not have looked to the teachings Hubert, et al. In other words, it is respectfully submitted that the teachings of Chou and of Hubert, et al., are directed to non-analogous arts.

Moreover, it is emphasized that Chou discloses a release film over the entire contact surface, to facilitate release of the mold from the formed surface. Thus, it is emphasized that Chou is concerned with facilitating release. In contrast, and as applied by the Examiner, Hubert, et al., has differentiated surfaces. It is respectfully submitted that such differentiated surfaces would destroy Chou for its intended purpose, of facilitating release of the entire mold surface. As the teachings of Hubert, et al., as applied by the Examiner, would destroy Chou for its intended purpose, clearly this combination of teachings of references is improper. See In re Ratti, 123 USPQ 349 (CCPA 1959).

The contention by the Examiner in Item 7, on page 5 of the Office Action mailed October 31, 2004, that Chou and Hubert, et al., both pertaining to imprinting arts, thus are strongly related arts, is respectfully traversed. Again, it is emphasized that Chou is directed to nanoimprint lithography, while Hubert, et al. is directed to contact print methods. Thus, the contention by the Examiner that "both pertain to imprinting arts" is not seen. As shown previously, the references are directed to different technologies, addressing different problems, and thus are directed to non-analogous arts.

The contention by the Examiner that the contact printing art of Hubert, et al., "is a related field [to that of Chou] that also addresses the use of a mold with contact with a molded material" is noted. However, it is emphasized that Hubert, et al., is directed to a liquid embossing technique, providing a stamp that includes a differentiated embossing surface, "to enhance the ability of the stamp to selectively displace liquid ink from a print surface and/or remove solvent from the liquid in a soft curing process. Note the Abstract of Hubert, et al. Accordingly, the contention by the Examiner that Hubert, et al., uses "a mold" is not seen.

Applicants respectfully traverse the contention by the Examiner in the sentence bridging pages 5 and 6 of the Office Action mailed October 31, 2007, that the concept of applying a release layer to one particular portion of the surface is known, as shown by Hubert, et al. Again, it is emphasized that Hubert, et al., discloses a liquid embossing technique using a stamp including differentiated surfaces with protruding features, recessed features or a combination thereof having differentiated surface energies and/or wettability. Noting that the Abstract of Hubert, et al. emphasizes that Hubert, et al., is directed to a contact print method using liquid embossing techniques, a basis is not seen for the conclusion by the Examiner that Hubert, et al., shows the concept of applying a release layer to one particular portion of the surface.

In addition, the problems addressed by the present invention, e.g., as described on pages 2 and 3 of Applicants' specification, are noted. Such problems are clearly different from the problem addressed by Hubert, et al. As the problems are different, it is respectfully submitted that one or ordinary skill in the art involved in connection with the present invention would not have looked to the teachings of Hubert, et al., to solve problems addressed in connection with the present invention.

In any event, again emphasizing the differences in technology and problems addressed in Chou and in Hubert, et al., it is respectfully submitted that there would have been no reason to combine the teachings of Chou and Hubert, et al., absent hindsight use of Applicants' disclosure, which of course is improper under the guidelines of 35 USC 103.

Even assuming, arguendo, that the teachings of Chuo and of Hubert, et al. were properly combinable, it is respectfully submitted that the teachings of these references would have neither disclosed nor would have suggested such

nanoprinting mold as in the present claims, including, inter alia, wherein the mold-releasing agent is a solid, and has a coefficient of friction smaller than that of the concave portions.

Moreover, it is emphasized that Hubert, et al. discloses treatment of the stamp to enhance the ability of the protruding features to displace the liquid ink by modifying the surface energy and/or modifying the wettability of the protruding stamp surfaces relative to the recessed stamp surfaces. It is respectfully submitted that such disclosure of "modifying the surface energy and/or modifying the wettability of the protruding stamp surfaces", even together with the teachings of Chou, would have neither disclosed nor would have suggested the mold-releasing agent provided only on top surfaces of the convex portions of the mold, as in the present invention, and advantages thereof, or wherein the mold-releasing agent is a solid and a has a relative coefficient of friction as in the present claims.

The contention by the Examiner in the first paragraph on page 3 of the Office Action mailed October 31, 2007, that Hubert, et al. teaches the concept of differentiated protruding surfaces that are coated and different from recessed surfaces, is noted. However, it is respectfully submitted that Hubert, et al. discloses providing protruding surfaces substantially different from recessed surfaces to alter or modify the surface properties of the substrate or print medium in the regions of contact, and preventing re-flow of liquid ink. Note column 3, lines 45-52, of Hubert, et al. It is respectfully submitted that such disclosure, even in combination with the teachings of Chou, would have neither taught nor would have suggested such mold-releasing agent as in the present claims, in particular, a mold-releasing layer provided only on the top surfaces of the convex portions of the mold (note claim 8), achieving advantages of the present invention as discussed previously, or relative

coefficient of friction (not wettability) as in the present claims, and advantages thereof.

It is respectfully submitted that the additional teachings of the further secondary references applied by the Examiner would not have rectified the deficiencies of the combined teachings of Chou and of Hubert, et al., such that the presently claimed invention as a whole would have been obvious to of ordinary skill in the art.

Seltmann, et al., discloses aqueous solutions or suspensions containing glycidoxypropyl silanol and polydimethyl siloxanes having a number average molecular weight of more than 100,000, as mold release agents for plastics. Note, in particular, the mold release agent described in column 2, lines 4-10. See also the paragraph bridging columns 1 and 2 of this patent.

Willson, et al., discloses fabrication of various microstructures using lithograph techniques, including covering a transfer layer with a polymerizable fluid composition; contacting the polymerizable fluid composition with a mold having a relief structure formed therein such that the polymerizable fluid composition fills the relief structure in the mold; subjecting the fluid composition to conditions to polymerize the fluid composition and form a solidified polymeric material therefrom on the transfer layer; separating the mold from the solidified polymeric material; and finally subjecting the transfer layer and the solidified polymeric material to an environment that allows for selectively etching the transfer layer relative to the solidified polymeric material such that a relief image is formed in the transfer layer. Note column 2, lines 25-41. See the paragraph bridging columns 3 and 4 of this patent, describing the mold, and disclosing that typically the materials are selected such that the mold is transparent which allows the polymerizable fluid composition

covered by the mold to be exposed to an external radiation source; and to facilitate release of the mold from the solid polymeric material, the mold may be treated with a surface modifying agent, such being known in the art, an example thereof being a fluorocarbon silylating agent.

Osawa, et al., discloses an injection mold suited for injection molding liquid rubber compositions into ring-shaped articles such as O rings and square rings, the injection mold being defined most generally in column 2, lines 24-36. This patent goes on to disclose that the injection mold is typically subjected to surface treatment for improving abrasion resistance, preventing corrosion and improving mold release properties or for any other purpose, the surface treatment being any ordinary mold surface treatment as typified by nickel plating or chromium plating, although surface treatment with diamond-carbon (DLC) or tri-iron tetroxide is preferred. Note column 5, line 46 through column 6, line 8.

Even assuming, arguendo, that the teachings of any one of Seltmann, et al., Willson, et al., and Osawa, et al. were properly combinable with the teachings of Chou and Hubert, et al., and that the teachings of Hubert, et al., were properly combinable with the teachings of Chou, such combined teachings would have neither disclosed nor would have suggested the presently claimed mold, including the mold-releasing agent provided only on top surfaces of the convex portions of the mold, this mold-releasing agent being a solid and having a lower coefficient of friction than that of the concave portions, and advantages thereof in the nanoprinting mold as presently claimed which uses a press machine wherein the resin substrate or the resin film on a substrate is deformed by the nanoprinting mold; and/or other features of the present invention as in the dependent claims, as discussed previously, and advantages thereof.

In view of the foregoing comments and amendments, as well as in view of the comments and amendments in the Amendment After Final Rejection filed April 30, 2008; and, moreover, in view of the concurrently filed RCE Transmittal, entry of the present amendments and of the amendments in the Amendment After Final Rejection filed April 30, 2008, and reconsideration and allowance of all claims presently being considered on the merits in the above-identified application, are respectfully requested.

To the extent necessary, Applicants hereby petition for an extension of time under 37 CFR 1.136. Kindly charge any shortage of fees due in connection with the filing of this paper, including any extension of time fees, to the Deposit Account of Antonelli, Terry, Stout & Kraus, LLP, Account No. 01-2135 (case 1021.43681X00), and please credit any overpayments to such Deposit Account.

Respectfully submitted,

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